BILLBERG, H.

Lateral curvature of the spine (scoliosis)

and its treatment by rational exercises according to Ling's Swedish system.

I edition. 1892.
II edition. 1930.

RILLBERG

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LATERAL CURVATURE

OF THE

SPINE (SCOLIOSIS)

AND ITS TREATMENT BY RATIONAL EXERCISES ACCORDING TO
LING'S SWEDISH SYSTEM

BY

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LONDON.
1892

LATERAL CURVATURE OF THE SPINE
(SCOLIOSIS)

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PREFACE.

As the disease treated of in the following pages is so common amongst children, especially girls, and knowing the great interest the people of this country take in the care of their children, I think it advisable to bring together, in pamphlet form, a series of short articles which have already appeared in a well-known periodical dealing with the culture of children.

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September, 1892.

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LATERAL CURVATURE OF THE SPINE (SCOLIOSIS).

Before going into the description of this abnormal condition of the spine, I must give a short account of its normal state.

The spinal column is composed of 33 separate bones called vertebræ, of which 24, namely, 7 in the neck (cervical), 12 in the back (dorsal), and 5 in the loins (lumbar), are called true vertebræ ; the following 9 are the false ones :—5 uniting to form a single bone (sacrum), and the succeeding four making up the coccyx, which may be regarded as the rudimentary tail. They are situated one upon the other and united by joints, capsules, ligaments and muscles. Between the true vertebræ there is a fibro-cartilage, whereby the mobility of the spinal column is increased. The spinal column, when seen from behind, forms a straight line in its healthy condition, from the head to its extremity, when a person is standing with his heels together and resting the weight of the body equally on both feet. The chief balancing power of the spine consists of muscles, or sets of muscles, corresponding to each other on both sides of the spine and being of the same strength. Their origin is from the hip-bones, ribs, shoulders, and head, with attachments to the vertebræ.

By Scoliosis is meant any more or less permanent deviation of the spinal column sideways from the normal position. Two kinds are noticed:—(1) *Scoliosis muscularis*, where the primary cause is to be found in the back-muscles which balance the spine. (2) *Scoliosis ossicularis*, where the origin of the complaint is to be traced either to existing or previous disease of the bony structures of the vertebræ.

The most frequent form of scoliosis is the muscular one, and it is of this that I propose to treat. *Scoliosis ossicularis*, caused mostly by rickets during the first five years of life, does not, as a rule, come under this method of treatment.

Scoliosis muscularis commences in nearly all cases very insidiously, and for this reason parents and guardians of children do not recognise the onset of the complaint until some alteration in the position of the shoulders or hips is apparent. An unsymmetrical relation of the shoulders to the spine does not necessarily pre-suppose a lateral curvature of the spinal column, but it ought always to be a warning to the parents to have the child examined immediately by a competent authority. In fact, if parents knew how much better and easier it is to prevent than to cure the disease, they would more frequently than is now generally the case have their children examined from time to time during growth, so that if the muscles of the back show any tendency to weakness or an unequal development, tending to curvature, the muscular system of the children could, by suitable exercises, be strengthened, and the beginning of the complaint prevented.

The first stage of scoliosis appears as a deviation to one or other side, in the form of a curve somewhat corresponding to the letter C, existing chiefly in the dorsal or lumbar regions, or involving part of both. Formerly some authorities considered that a slight physiological deviation always existed in the region of the third, fourth, and fifth dorsal vertebræ, with the convexity towards the right side, depending, as they averred, either upon the movements of the heart or the pulsation of the great blood-vessel from the heart; but now it is generally acknowledged that any permanent lateral deviation of the spine is abnormal. In this early stage of the disease the patient is able, by his own will-power, to straighten out the curve when standing, and it also disappears on assuming the horizontal position.

In the second stage of the disease there is found to be a compensatory curve in addition to the original one, so that the spine seen from behind has somewhat the form of the letter S. The spine can, by extension, be passively brought back to its position, but not actively, by the patient himself. When the extension-power is withdrawn the spine resumes its abnormal condition.

The disease has entered its third stage when rotation of the vertebræ round their perpendicular axis exists in combination with wedge-shaped deformity of the intervertebral cartilages and vertebræ. Then the spine cannot be perfectly restored to its normal position by extension, the only effect being reduction of the depth of the curves.

In the fourth and last stage of scoliosis there is immobility due to ankylosis or growing together of the deformed vertebræ. During its progress we observe in scoliosis alteration of the form of the intervertebral cartilages and vertebræ, and more marked change in the position of the ribs, collarbones, shoulders, hips and internal vital organs.

By the pressure of the vertebræ towards each other in the concavity of the curve, the intervertebral cartilages are reduced in size on this side and gradually worn out, whereby the vertebra now directly pressing on each other also wear and become wedge-shaped, and in advanced cases of the disease their bodies become united.

In rotation of the vertebræ round their perpendicular axis the bodies of the vertebræ are drawn to the convexity of the curve, the arches with the processes of the vertebræ towards the concavity. When a dorsal curve exists, with rotation of the vertebræ, the symmetrical relation between the ribs is altered. The distance between them is increased on the convexity and diminished on the concavity of the curve, which sometimes develops so far that the ribs on the concave side grow together.

The situation of the shoulders is changed. Towards the convexity the shoulder is moved upwards, with the lower angle of the shoulber-blade relaxed and more prominent; towards the concavity it is lowered, lying with its lower angle close to the ribs.

The point of the shoulder (acromion) beonging to the side where the convexity of a dorsal curve is present is directed more backwards than that corresponding to the concavity, and the surface over the collar-bone corresponding to a dorsal convexity is more fallen in, the same area on the other side is more arched.

The normal relation between the hips is altered with a lumbar curve. If there is scoliosis, with its convexity say to the left, the right hip is elevated and more turned forward than the left one, and *vice versâ*.

The two halves of the head and the face are also apt in scoliosis of the cervical vertebræ to undergo a change in development, so that the half corresponding to the concavity is less developed than the other, probably depending on compression of the vessels and nerves of that side.

In the two last stages of the complaint, very often the normal situation and form of the heart, lungs, liver, &c., are changed, with serious disturbances of the circulatory, respiratory, and digestive organs, and the consequences resulting therefrom.

According to many prominent scientists who have studied this subject, the muscles on the convexity of the curve are relaxed in tone, pale, and badly nourished; while the corresponding muscles on the other side of the spine in the concavity are increased in tone (although not contracted), better nourished, redder, and more elastic.

Sometimes a scoliosis does not develop further than to its second stage, where it stops; but in most cases, if not properly treated, it advances till the worst forms are reached. Leaving the disease to itself, under the impression that the individual will gradually "grow out of it," is a very terrible mistake.

Where have we to seek the chief cause for this form of scoliosis, which is so common in these days? Two different theories have for a long time been in antagonism regarding this point. The first, that the essential cause is to be found in often repeated positions of the body with an unevenness of the distribution of the weight of the body on the spine. The physiological curve caused hereby should become a permanent (pathological) one, when by the pressure on the concave side of the curve the regeneration of the tissues of the spinal column becomes retarded on this side, whilst it is normal on the convex side of the curvature.

The second, that the origin of the disease depends on disturbed muscular action of some of the corresponding muscles which are situated on either side of the spine, and by their healthy action of equal strength maintain the spine in its normal position. The latter theory is the one now most universally adopted, and is that on which Ling based his treatment of the disease. If the muscles on one side of the spine lose a part of their energy whilst the same muscles on the other side keep their normal tone, then it is obvious that the stronger muscles will bend the spinal column so that the concavity of the curve will be lying towards the side of the stronger ones, the convexity towards those which are weaker.

The disease appears far more frequently in girls than in boys, and commences generally when the children are between ten and fifteen years of age. Very often we are able to discover that the tendency is inherited from mother to daughter, and that this weakness has been present for several generations in the same family. That the complaint is more common in girls than in boys probably depends on the fact that the hurtful influence of using the right arm and leg more than the left ones in ordinary daily work, is more counteracted by sports and strengthening bodily exercises in boys than in girls. That scoliosis is chiefly caused by one-sided use of the right arm and leg is proved, because in most cases it makes its first appearance with a dorsal curve, the convexity of which lies towards the right side, or with a lumbar curve with opposite situation. If we look at the naked back of a young individual who is writing in sitting position with his penholder in his right hand, we find that the spine is curved in the dorsal part with the convexity towards the right. The weaker the child the more pronounced is the curve. When now, as is generally the case during a child's school-years, this natural position, if we are allowed to call it so, is maintained for some hours every day, it is manifest that the physiological curve, especially if a disposition to the complaint exists, sooner or later may become a pathological one. I hesitated a little in calling the writing position a *natural* one because by civilisation man is forced to accept certain positions which, strictly seen, are abnormal. We find such unnatural positions also in trade work of more minute nature as in decorative painting, watch-making, &c. If the body is not fully and strongly developed, these positions, when maintained for protracted or repeated periods, no doubt predispose in a great degree to the development of deformity of the spine. The cause of the bending of the spinal column in the dorsal part with the convexity towards the right, when writing, is, that in order to keep the position the flexors of the left side are obliged to be in constant work (contraction) while the corresponding muscles on the other side are only passively extended. When we exert the right arm more, as in lifting heavy weights, the flexor muscles of the left side must further work in trying to move the weight of the body over to the left for the sake of maintaining the balance. The flexors of the right side are passively extended, and when this passive extension is often repeated, the muscles themselves decrease in strength. When this has taken place the balance of the spinal column is disturbed and scoliosis has set in.

In resting on one leg the spine is bent in the lumbar part with the convexity of the curve towards the opposite side. Because the right leg is more developed than the left in nearly all persons, just as the right arm generally is stronger than the left one, children very often get into a favourite habit of resting on the right leg, in consequence of which the physiological curve is apt to become a permanent one.

Often when a person is sitting, chiefly in writing position, he rests more on the right half of the buttock than on the left one. The right hip is hereby elevated, depending on the resulting curve in the lumbar region with the convexity to the left. In this position, as also in the position that ladies have on horseback, there is the same danger as in standing by preference on the right leg.

Scoliosis in its early stage, if not cured in time, whether it has commenced in the dorsal or lumbar parts of the spine, goes on developing in compensatory curves, so that if one curve exists with the convexity towards the right side in the dorsal region, causing the point of gravitation of the body to move sideways beyond the middle line, the flexors of the lumbar part of the opposite side exert themselves to regain the balance, and, as a consequence, a curve in the lumbar part, with the convexity towards the left side is established, and *vice versâ*.

The rotation of the vertebræ round the perpendicular axis is also regarded as a compensatory act of nature, for by this arrangement, pressure on the transverse process of an overlying and an underlying vertebra is prevented.

In the first and second stages of scoliosis, where no organic change has taken place in the intervertebral cartilages and vertebræ, the disease is curable by Ling's system. In the third stage, where the vertebræ have undergone a wedge-shaped alteration, it is, of course, not possible to effect a cure, although the treatment will strengthen the muscles, and thus prevent the disease developing further. In its fourth stage nothing can be done by movements with a view to improving the condition of the spine.

The oldest method for the treatment of

scoliosis is the orthopædic one. In this it is attempted by outward mechanical pressure to stretch the spine. But if we rightly understand the cause of the *scoliosis muscularis*, that is, relaxation and consequent weakness of the opposing muscles of the one side of the spine, then we can at once conceive that pressure which tends to bring the spine back to its normal position is not enough to cure the disease, for by pressure we cannot strengthen the weak muscles. This can only be done by two means: movements and electricity. Many persons consider that movement is, no doubt, the principal curative agent, but that the Ling treatment must always be assisted by the orthopædic one as being the most powerful in stretching the spine. This argument would be perfectly right if we could not quite extend the spine by movements in the first stages of the disease. But we are able by movements, as is most clearly seen in a scoliosis of the first stage, not only to stretch out the spine perfectly, but also for the moment to transfer the curve to the opposite side. We possess, therefore, in the Ling treatment the two most important factors for curing a lateral curvature of the spine, namely, means of strengthening the weak and diseased muscles, and of stretching the spinal column in the highest possible degree.

Thus, in the first and second stages of scoliosis, it is decidedly wrong to use any mechanical supports whatever, instead of a rational treatment by movements, and it is also wrong to think that the two different methods combined will sooner produce a cure than the Ling treatment alone. Mechanical supports and ordinary corsets, although of best make, will always cause pressure where it is not wanted, stopping the circulation more or less in the muscles, which makes them weaker, and giving the patient much unnecessary pain and discomfort. The support, fulfilling the work the muscles themselves ought to do, and leaving them at rest, takes away the principal means for their recovery. The spine, being gradually straightened out by this outward pressure, cannot, when the support is left off, keep in the right position, for the weak muscles are not made stronger by this treatment—rather the reverse.

In the third stage of scoliosis, where anatomical deformities in the cartilages and vertebræ exist, we can, by movements, strengthen the back-muscles, and in most cases improve the condition.

In extreme cases of this stage, it is often advisable to use mechanical supports, which are taken off during the exercises. In the fourth stage, the orthopædic treatment is the only one which can prevent the disease developing further, and ease the deplorable condition of the patient.

The treatment of the first stage of scoliosis by movements is in principle very simple. Here we must aim at strengthening the muscles on one side, which in some way or the other have got weaker than their antagonists. As before mentioned, it is the muscles lying on the convex side of the curve which are diseased, and movements acting effectively for their improvement are easily found. As in this stage of scoliosis, in most cases, the convexity is lying towards the left side in the lumbar and lower part of the dorsal region, powerful side-bendings towards the left must be done from different initial positions. During these one-sided side-bendings the left side's weaker extensors are brought into contraction, while the same muscles on the right side are only passively extended. The curve towards the left in the vertebræ is straightened out by the movement, and at its maximum the convexity is brought over to the right side. If the convexity is lying to the right, which is rare, right-sided side-bendings must, of course, be used. It is chiefly two movements in the treatment of the left-sided C-formed scoliosis which can be called special ones. The first is *standing side-bending to the left*, the hands fixed at the hips, or still better at the neck, with the chest well expanded, and the head kept well up with the chin drawn in. The operator puts his one hand on the highest point of the curve, his other hand on the patient's right hip. The best way of performing this movement is to place the patient so that, when he is standing as straight as he is able to do, he has a firm object such as a bar touching his right hip, preventing him, when bending, from moving his hip towards the right side. After the position is taken, the bending, controlled by the operator, is performed slowly and exactly towards the left, and repeated according to the strength of the patient. *Lying position on the right side, and bending to the left*, is the second important movement. The patient is lying on a low specially-made sofa, without a back, and on his right side, with the upper part of his body from the hip-joint outside the sofa, parallel with the floor, and his hands fixed at his hips, while an assistant holds his legs firmly. It is most important that the patient shall never come further down than to a parallel relation with the floor. From this position bendings are performed to the left and back to the original position, as often as can be done without fatiguing the patient too much. The left side's muscles are brought into play, and the curve, especially in the lumbar region, is considerably acted on. Should the right shoulder be lower than the left one, arm-stretchings upwards with the right arm only are performed from different initial positions; and should the right hip be to any noticeable degree higher than the left one, we use active hip-drawing upwards in a lying position on the back.

In the treatment of scoliosis in its second stage, we cannot attend to each of the curves for itself by one-sided movements, for the exercise that acts beneficially on one curve would hurt the other one. In these cases we must use movements acting by extension on both the curves simultaneously. This extension is either passive—if the weight of the body is used for this purpose without bringing the back-muscles into contraction—or active, when the back-muscles on the same time are brought into play. Thus we use two types of movements for the treatment of such scoliosis ; the hanging position, representing the passive extension, and the cross-lying position, representing the active one. In the *hanging position*, which is taken on a bar, parallel with the floor, and placed so high that the feet of the patient cannot touch the ground, we must carefully watch that the patient is hanging equally by both his arms, and that they are kept quite straight, for, in the opposite case, the back is not extended as we aim at. The operator can increase the extending power of the weight of the patient by putting his hands on the highest points of the curves and pressing them together.

The cross-lying position, representing the active type of movements used for this purpose, is taken across a narrow stool or bench (the face towards the floor) between the knees and the hips, leaving the hip-joints free to move. The patient's feet are pressed down by an assistant, and he fixes his hands to his hips, keeping parallel with the ground. The operator superintends very carefully, so that during every stage of the movement the legs and the trunk are in a straight line. After bending back as far as possible the patient bends forward again, and so on as many times as can be done without overtaxing his strength. In this movement, rightly taken, nearly all of the back-muscles are brought into play and the curves straightened out. Of course, it is impossible to mention here all the movements used in the treatment of this form of scoliosis, but I hope that the two types I have tried to describe will give some idea of the method. The lower shoulder and hip must be attended to by corrective movements, and should the patient suffer from other complications, such as heart disease, digestive troubles, &c., they must be specially treated by other movements. Scoliosis, in its third stage, is treated in the same way as in the second stage.

Although the principles of the treatment are very simple to understand, the treatment itself, being built on the pedagogical modification of Ling's system, cannot be rightly and practically performed by anyone who has not been specially trained for it.